

AMENDMENT TO THE CLAIMS

1. (Currently Amended) A coordinates correction apparatus comprising:
 - coordinate input means being placed on a display unit;
 - display control means for controlling display of a plurality of reference points on the display ~~such that all of the reference points yet to be designated are displayed for designation in an arbitrary order~~ unit, the reference points indicating positions for ~~user-designated coordinates on the coordinate input means~~ use in calculating coordinates correction parameters, wherein said coordinate input means inputs a coordinate corresponding to one of the displayed reference points based on a user designation;
 - coordinate[[s]] reception means for receiving ~~coordinates designated for the coordinate input by said coordinate input means corresponding to the one of the displayed reference points by user via said coordinate input means;~~
 - discriminating means for discriminating, among the displayed reference points, a reference point corresponding to the ~~user-designated~~ coordinate received by said coordinate reception means; ~~as a discriminated reference point, from the displayed reference points;~~
 - coordinates keeping means for keeping the ~~user-designated~~ coordinate receiving by said coordinate reception means as the coordinate corresponding to the reference point discriminated by said discriminating means;
 - repeating means for repeating processes of said display control means, said coordinate reception means, said discriminating means and said coordinates keeping means

to obtain coordinates for remaining reference points for which a coordinate is not kept by said coordinates keeping means, wherein said display control means is controlled to display only the remaining reference points;

parameter calculation means for calculating coordinates correction parameters for nonlinear conversion, based on the coordinates kept by said coordinate keeping means;

parameter keeping means for keeping the calculated coordinates correction parameters for nonlinear conversion; and

coordinates correction means for correcting the coordinates input ~~inputted~~ via said coordinates input means by the nonlinear conversion using the calculated coordinates correction parameters, ~~kept by the parameter keeping means;~~

~~wherein said display control means controls reference points so as not to display the discriminated reference point discriminated by said discriminating means;~~

2. (Currently Amended) The coordinates correction apparatus of Claim 1, wherein the coordinates correction parameters are a, b, c, d, e, f, g, and h and wherein the nonlinear conversion for correcting the coordinates (x, y) input ~~inputted~~ via the coordinates input means to corrected coordinates (X, Y) is expressed by:

$$X = axy + bx + cy + d$$

$$Y = exy + fx + gy + h.$$

3. (Cancelled)

4. (Original) The coordinates correction apparatus of Claim 1, further comprising a coordinates output means for outputting the coordinates corrected by the coordinates correction means.

5. (Cancelled)

6. (Cancelled)

7. (Currently Amended) The coordinates correction apparatus of Claim 1, ~~wherein the processes being executed by said display control means, said coordinate reception means, said discriminating means and said coordinate keeping means repeat until the user-designated coordinates are kept for all of the plurality of reference points, and~~ wherein the parameter calculation means calculates the coordinates correction parameters for the nonlinear conversion based on the coordinates kept for all of the plurality of reference points.

8. (Previously Presented) The coordinates correction apparatus of Claim 1, wherein the parameter calculation means calculates the coordinates correction parameters by solving simultaneous equations based on the kept coordinates corresponding to the plurality of displayed reference points.

9. (Previously Presented) The coordinates correction apparatus of

Claim 1, wherein said display is a liquid crystal display.

10. (Previously Presented) The coordinates correction apparatus of Claim 1, wherein the plurality of displayed reference points is four reference points expressed in pairs of two x coordinates and two y coordinates in an xy rectangular coordinates system.

11. (Currently Amended) The coordinates correction apparatus of Claim 10, wherein the parameter calculation means calculates the coordinates correction parameters a, b, c, d, e, f, g, and h by solving the following formulas where the coordinates of the four reference points as (X_0, Y_0) , (X_1, Y_0) , (X_0, Y_1) , and (X_1, Y_1) , setting the received coordinates as (x_{nw}, y_{nw}) , (x_{ne}, y_{ne}) , (x_{sw}, y_{sw}) , and (x_{se}, y_{se}) ;

$$X_0 = ax_{nw}y_{nw} + bx_{nw} + cy_{nw} + d$$

$$Y_0 = ex_{nw}y_{nw} + fx_{nw} + gy_{nw} + h$$

$$X_1 = ax_{ne}y_{ne} + bx_{ne} + cy_{ne} + d$$

$$Y_0 = ex_{ne}y_{ne} + fx_{ne} + gy_{ne} + h$$

$$X_0 = ax_{sw}y_{sw} + bx_{sw} + cy_{sw} + d$$

$$Y_1 = ex_{sw}y_{sw} + fx_{sw} + gy_{sw} + h$$

$$X_1 = ax_{se}y_{se} + bx_{se} + cy_{se} + d$$

$$Y_1 = ex_{se}y_{se} + fx_{se} + gy_{se} + h,$$

wherein the parameter keeping means keeps the calculated coordinates

correction parameters a, b, c, d, e, f, g, and h, and

wherein the coordinates correction means corrects the coordinates input
~~inputted~~ via said coordinate input means (x, y) to corrected coordinates (X, Y) by the
nonlinear conversion

$$X = axy + bx + cy + d$$

$$Y = exy + f x + gy + h.$$

12. (Previously Presented) The coordinates correction apparatus of Claim 1, further comprising a deciding means for deciding to control reference point display using said display control means, to receive coordinates using said coordinates reception means, to discriminate using said discriminating means, to keep user-designated coordinates using said coordinates keeping means and to calculate coordinates correction parameters using said parameter calculation means in a case that said parameter keeping means does not keep the coordinates correction parameters.

13. (Previously Presented) The coordinates correction apparatus of Claim 1, wherein the coordinates correction apparatus is a portable information processing apparatus.

14. (Previously Presented) The coordinates correction apparatus of Claim 1, wherein the coordinates correction apparatus can be connected to a network.

15 to 21. (Cancelled)

22. (Currently Amended) A coordinates correction method for controlling a coordinates correction apparatus which has a coordinate input means placed on a display unit, the method comprising:

controlling display of a plurality of reference points on the display ~~such that all of the reference points yet to be designated are displayed for designation in an arbitrary order~~ unit, the reference points indicating positions for ~~user-designated coordinates on the coordinate input means~~ use in calculating coordinates correction parameters, wherein said coordinate input means inputs a coordinate corresponding to one of the displayed reference points based on an user designation;

receiving ~~coordinates designated for~~ the coordinate input by said coordinate input means corresponding to the one of the displayed reference points ~~by user via said coordinate input means;~~

discriminating, among the displayed reference points, a reference point ~~corresponds~~ corresponding to the ~~user-designated~~ coordinate ~~corresponding~~ received in said receiving step; ~~coordinates as a discriminated reference point, from the displayed reference points;~~

keeping the ~~user-designated~~ coordinate received in said receiving step as the coordinate corresponding to the reference point discriminated in said discriminating step as the coordinate corresponding to the reference point discriminated in said discriminating step; ~~which reference point corresponds to the user-designated coordinate;~~

repeating said display controlling, receiving, discriminating and keeping steps to obtain coordinates for remaining reference points for which a coordinate is not kept in said keeping step, wherein said display controlling step controls display of reference points to display only the remaining reference points;

calculating coordinates correction parameters for nonlinear conversion, based on the coordinates kept in said step of keeping user-designated coordinate;

keeping the calculated coordinates correction parameters for nonlinear conversion; and

correcting the coordinates input ~~inputted~~ in the coordinates receiving step by the nonlinear conversion using ~~the kept in said keeping~~ the calculated coordinates correction parameters. [[,]]

~~wherein the discriminated reference point discriminated in said discriminating is not displayed in said controlling display.~~

23. (Currently Amended) The coordinates correction method of Claim 22, wherein the coordinates correction parameters are a, b, c, d, e, f, g, and h, and wherein the nonlinear conversion for correcting the coordinates (x, y) input ~~inputted~~ via the coordinates receiving step to the corrected coordinates (X, Y) in said coordinates correction step is represented by

$$X = axy + bx + cy + d$$

$$Y = exy + f x + gy + h.$$

24. (Cancelled)

25. (Original) The coordinates correction method of Claim 22, further comprising a coordinates output step of outputting the coordinates corrected in the coordinates correction step.

26. (Cancelled)

27. (Cancelled)

28. (Currently Amended) The coordinates correction method of Claim 22, ~~wherein said steps of controlling display of a plurality of reference points, receiving coordinates, discriminating which reference point corresponds to the user-designated coordinate and keeping the user-designated coordinate are repeated until the user-designated coordinates are kept for all of the plurality of reference points, and~~ wherein the coordinates correction parameters for the nonlinear conversion based on the coordinates kept for all of the plurality of reference points are calculated in said step of calculating coordinates correction parameters.

29. (Previously Presented) The coordinates correction method of Claim 22, wherein said step of calculating coordinates correction parameter is executed by solving simultaneous equations based on the kept coordinates corresponding to the

plurality of displayed reference points.

30. (Previously Presented) The coordinates correction method of Claim 22, wherein said display is liquid crystal display.

31. (Previously Presented) The coordinates correction method of Claim 22, wherein the plurality of displayed reference points is four reference points expressed in pairs of two x coordinates and two y coordinates in an xy rectangular coordinates system.

32. (Currently Amended) The coordinates correction method of Claim 31, wherein coordinates correction parameters, a, b, c, d, e, f, g, and h, are calculated in the parameter calculation step by solving the following formulas where the coordinates of the four reference points as (X_0, Y_0) , (X_1, Y_0) , (X_0, Y_1) , and (X_1, Y_1) , setting the received coordinates as

(x_{nw}, y_{nw}) , (x_{ne}, y_{ne}) , (x_{sw}, y_{sw}) , and (x_{se}, y_{se}) :

$$X_0 = ax_{nw}y_{nw} + bx_{nw} + cy_{nw} + d$$

$$Y_0 = ex_{nw}y_{nw} + fx_{nw} + gy_{nw} + h$$

$$X_1 = ax_{ne}y_{ne} + bx_{ne} + cy_{ne} + d$$

$$Y_0 = ex_{ne}y_{ne} + fx_{ne} + gy_{ne} + h$$

$$X_0 = ax_{sw}y_{sw} + bx_{sw} + cy_{sw} + d$$

$$Y_1 = ex_{sw}y_{sw} + fx_{sw} + gy_{sw} + h$$

$$X_1 = ax_{se}y_{se} + bx_{se} + cy_{se} + d$$

$$Y_1 = ex_{se}y_{se} + fx_{se} + gy_{se} + h,$$

wherein the calculated coordinates correction parameters are kept in the parameter keeping step, and

wherein the coordinates input ~~inputted~~ via said coordinates receiving step (x, y) are corrected to corrected coordinates (X, Y) in the coordinates correction steps by the nonlinear conversion

$$X = axy + bx + cy + d$$

$$Y = exy + fx + gy + h.$$

33. (Previously Presented) The coordinates correction method of Claim 22, further comprising deciding to perform said steps of controlling display of a plurality of reference points, receiving coordinates, discriminating which reference point corresponds to the user-designated coordinate, keeping the user-designated coordinate and calculating coordinates correction parameters in a case that said step of keeping calculated coordinates correction parameters does not keep the coordinates correction parameters.

34. (Previously Presented) The coordinates correction method of Claims 22 which is a coordinates correction method for controlling a portable information processing apparatus.

35 to 41. (Cancelled)

42. (Currently Amended) A computer-readable memory medium for storing a coordinates correction control program for controlling a coordinates correction apparatus which has a coordinate input means placed on a display unit, execution steps of the program comprising:

controlling display of a plurality of reference points on the display ~~such that~~
~~all of the reference points yet to be designated are displayed for designation in an arbitrary~~
~~order~~ unit, the reference points indicating positions for ~~user-designated coordinates on the~~
~~coordinate input means~~ use in calculating coordinates correction parameters, wherein said
coordinate input means inputs a coordinate corresponding to one of the displayed reference
points based on an user designation;

receiving ~~coordinates designated~~ the coordinate input by said coordinate
input means for the displayed reference points ~~by user via said coordinate input means;~~

discriminating, among the displayed reference points, a reference point
corresponding to the ~~user-designated~~ coordinate received in said receiving coordinates
step; ~~as a discriminated reference point, from the displayed reference points;~~

keeping the ~~user-designated~~ coordinate receiving in said coordinate
receiving step as the coordinate corresponding to the reference point discriminated in said
discriminating step; ~~which reference point corresponds to the user-designated coordinate;~~

repeating said display controlling, receiving, discriminating and keeping
steps to obtain coordinates for remaining reference points for which a coordinate is not
kept in said keeping step, wherein said display controlling step controls display of
reference points to display only the remaining reference points;

calculating coordinates correction parameters for nonlinear conversion,
based on the coordinates kept in said step of keeping user-designated coordinates;

keeping the calculated coordinates correction parameters for nonlinear
conversion; and

correcting the coordinates input ~~inputted~~ in the coordinates receiving step by
the nonlinear conversion using ~~the kept in said keeping~~ the calculated coordinates
correction parameters.

~~wherein the discriminated reference point discriminated in said
discriminating is not displayed in said controlling display.~~

43. (Currently Amended) The computer-readable memory medium of
Claim 42, wherein the coordinates correction parameters are a, b, c, d, e, f, g, and h, and
wherein the nonlinear conversion for correcting the coordinates (x, y) input ~~inputted~~ via the
coordinates receiving step to the corrected coordinates (X, Y) in said coordinates correction
step is represented by

$$X = axy + bx + cy + d$$

$$Y = exy + fx + gy + h.$$

44. (Cancelled)

45. (Previously Presented) The computer-readable memory medium of
Claim 42, further comprising outputting coordinates corrected in said coordinates

correction step.

46. (Cancelled)

47. (Cancelled)

48. (Currently Amended) The computer-readable memory medium for storing a coordinates correction control program of Claim 42, ~~wherein said controlling display of a plurality of reference points, said receiving coordinates, said discriminating a reference point corresponds to the user-designated coordinate and said keeping the user-designated coordinate are repeated until the user-designated coordinates are kept for all of the plurality of reference points, and~~ wherein the coordinates correction parameters for the nonlinear conversion based on the coordinates kept for all of the plurality of reference points are calculated in said calculating coordinates correction parameters.

49. (Previously Presented) The computer-readable memory medium of Claim 42, wherein said calculating coordinates correction parameter is executed by solving simultaneous equations based on the kept coordinates corresponding to the plurality of displayed reference points.

50. (Previously Presented) The computer-readable memory medium of Claim 42, wherein said display is liquid crystal display.

51. (Previously Presented) The computer-readable memory medium of Claim 42, wherein the plurality of displayed reference points is four reference points expressed in pairs of two x coordinates and two y coordinates in an xy rectangular coordinates system.

52. (Currently Amended) The computer-readable memory medium of Claim 51, wherein coordinates correction parameters, a, b, c, d, e, f, g, and h, are calculated in the parameter calculation step by solving the following formulas where the coordinates of the four reference points as (X_0, Y_0) , (X_1, Y_0) , (X_0, Y_1) , and (X_1, Y_1) , setting the received coordinates as (x_{nw}, y_{nw}) , (x_{ne}, y_{ne}) , (x_{sw}, y_{sw}) , and (x_{se}, y_{se}) :

$$X_0 = ax_{nw}y_{nw} + bx_{nw} + cy_{nw} + d$$

$$Y_0 = ex_{nw}y_{nw} + fx_{nw} + gy_{nw} + h$$

$$X_1 = ax_{ne}y_{ne} + bx_{ne} + cy_{ne} + d$$

$$Y_0 = ex_{ne}y_{ne} + fx_{ne} + gy_{ne} + h$$

$$X_0 = ax_{sw}y_{sw} + bx_{sw} + cy_{sw} + d$$

$$Y_1 = ex_{sw}y_{sw} + fx_{sw} + gy_{sw} + h$$

$$X_1 = ax_{se}y_{se} + bx_{se} + cy_{se} + d$$

$$Y_1 = ex_{se}y_{se} + fx_{se} + gy_{se} + h,$$

wherein the calculated coordinates correction parameters are kept in the parameter keeping step, and

wherein the coordinates input ~~inputted~~ via said coordinates receiving step (x, y) are corrected to corrected coordinates (X, Y) in the coordinates correction steps by

the nonlinear conversion

$$X = ax + by + cx + d$$

$$Y = ex + fy + gy + h.$$

53. (Previously Presented) The computer-readable memory medium of Claim 42, further comprising deciding to execute said display controlling step, said coordinates receiving step, and said parameter calculation step if said keeping step does not keep the coordinates correction parameters.

54. (Previously Presented) The computer-readable memory medium of Claim 42, wherein the program is a coordinates correction program for controlling a portable information processing apparatus.

55 to 61. (Cancelled)

62. (Previously Presented) The coordinate correction apparatus according to Claim 1, wherein said display control means causes the displayed reference point to disappear as said coordinates reception means receives the coordinates corresponding to the reference point.

63. (Previously Presented) The coordinate correction method of Claim 22, wherein said controlling display of a plurality of reference points on the display further

comprises causing the displayed reference points to disappear as the coordinates corresponding to the reference point are received by said receiving coordinates step.

64. (Previously Presented) The computer readable memory medium of Claim 42, wherein said controlling display of a plurality of reference points on the display further comprises causing the displayed reference points to disappear as the coordinates corresponding to the reference point are received by said receiving coordinates step.